

**SUPER NOZZLE CLEANER FOR CEILING FAN  
BLADE**

**NUR AFIQAH BINTI MOHD HASMADI**

**BACHELOR OF ENGINEERING TECHNOLOGY  
(ENERGY & ENVIRONMENTAL)**

**UNIVERSITI MALAYSIA PAHANG**

SUPER NOZZLE CLEANER FOR CEILING FAN BLADE

NUR AFIQAH BINTI MOHD HASMADI

Thesis submitted in fulfilment of the requirements  
Bachelor of Engineering Technology in Energy And Environmental

Faculty of Engineering Technology  
UNIVERSITI MALAYSIA PAHANG

JANUARY 2018

## **STATEMENT OF AWARD FOR DEGREE**

### **1. Bachelor of Engineering Technology**

Thesis submitted in fulfilment of the requirements for the award of the degree of Bachelor of Engineering Technology in Energy & Environmental.



## **SUPERVISOR'S DECLARATION**

We hereby declare that we have checked this thesis and in our opinion, this thesis is adequate in terms of scope and quality for the award of degree of Bachelor of Engineering Technology in Energy & Environmental

---

(Supervisor's Signature)

Name of Supervisor : DR. SITI NADIAH BINTI MOHD SAFFE  
Position : HEAD OF PROGRAM (MANUFACTURING) AND  
SENIOR LECTURER, FACULTY OF ENGINEERING  
TECHNOLOGY, UNIVERSITI MALAYSIA PAHANG  
Date : 4 JANUARY 2018



## STUDENT'S DECLARATION

I hereby declare that the work in this thesis is based on my original work except for quotations and citations which have been duly acknowledged. I also declare that it has not been previously or concurrently submitted for any other degree at Universiti Malaysia Pahang or any other institutions.

---

(Student's Signature)

Name : NUR AFIQAH BINTI MOHD HASMADI  
ID Number : TC14005  
Date : 4 JANUARY 2018

## ACKNOWLEDGEMENTS

Alhamdulillah, I am sincerely grateful to ALLAH "S.W.T" for giving me wisdom, strength, patience and assistance to complete my project work. Had it not been due to His will and favor, the completion of this study would not have been achievable.

This thesis would not have been possible without the guidance and the help of several individuals who contributed and extended their valuable assistance in the preparation and the completion of this project. I am deeply thanks to my supervisor of this project, Dr.Siti Nadiah binti Mohd Saffe, Head Program (Manufacturing) and Senior Lecturer of Faculty Engineering Technology for her patient, guidance, comment, suggestions and encouragement which helped me in all the time of this project. Not to be forgotten, all the instructors of Faculty of Engineering Technology (FTEK) and Faculty of Mechanical Engineering (FKM) of University Malaysia Pahang for giving guidance in making this project success especially in fabrication part.

I am also deeply indebted to my parents Mohd Hasmadi b Ismail and Nor Zalela bt Idris for supporting me continuously and keep giving me advices to be strong handling this project till the end. Lastly, a special thanks to my beloved partner, Nursyahirah binti Omar and all of my friends for their help and positives word of successes of this project from the beginning until the last. Thank you very much.

## TABLE OF CONTENT

	<b>Page</b>
<b>STATEMENT OF AWARD FOR DEGREE</b>	iii
<b>SUPERVISOR'S DECLARATION</b>	iv
<b>STUDENT'S DECLARATION</b>	v
<b>ACKNOWLEDGEMENTS</b>	vi
<b>ABSTRACT</b>	vii
<b>ABSTRAK</b>	viii
<b>TABLE OF CONTENTS</b>	ix
<b>LIST OF TABLES</b>	x
<b>LIST OF FIGURES</b>	xi
<b>LIST OF SYMBOLS</b>	xii
<b>LIST OF CHART</b>	xiv
<b>CHAPTER 1 INTRODUCTION</b>	1
1.1 Project Background	1
1.2 Problem statement	3
1.3 Objective	3
<b>CHAPTER 2 LITERATURE REVIEW</b>	4
2.1 Vacuum Cleaner	4
2.2 Ceiling Fan Cleaner	5
2.3 Vacuum Nozzle	6
2.4 Energy efficiency of Ceiling Fan	7
2.5 PLA plastic	8
2.6 Microfiber	9
<b>CHAPTER 3 METHODOLOGY AND MATERIALS</b>	12
3.1 Flowchart of Design	12
3.1.1 First Part of Design Super Nozzle Vacuum Cleaner	14
3.1.2 Second Part of Design Super Nozzle Vacuum Cleaner	18
3.2 Flowchart of Printing	23
3.4 Flowchart of Fabrication and Maintenance	27
3.3 Flowchart of Testing	30

<b>CHAPTER 4 RESULT AND DISCUSSION</b>	33
4.1 Efficiency of Design	33
4.2 Efficiency of Material	34
4.3 Machine Performance	39
4.4 Time Management	41
4.5 Cost Analysis	42
<b>CHAPTER 5 CONCLUSION AND RECOMMENDATION</b>	43
5.1 Conclusion	43
5.2 Recommendation	43
<b>REFERENCES</b>	45
<b>APPENDICES</b>	46
A. FINAL PART OF SUPER NOZZLE	46
B. MATERIAL CONDITION OF SUPER NOZZLE	47
C. CEILING FAN CONDITION	48
D. SHARP BRAND VACUUM SPECIFICATIONS	49
E. SPECIFICATION OF CEILING FAN	50



## LIST OF TABLES

<b>Table No.</b>	<b>Title</b>	<b>Page</b>
1	Recommended Air Change Rates	5
2	Reading of wind speed (m/s) before and after ceiling fan blade cleaning by using Extech mini-anemometer	34
3	Reading of room temperature (°C) before and after ceiling fan blade cleaning by using Extech mini-anemometer	34
4	Reading of wind speed (m/s) before and after ceiling fan blade cleaning by using Testo Anemometer	36
5	Reading of room temperature (°C) before and after ceiling fan blade cleaning by using Testo anemometer	36
6	Gantt chart of project	41
7	Cost analysis in fabricating and testing for Super nozzle cleaner	42

## LIST OF FIGURES

NO	TITLE	PAGE
1	Example of common ceiling fan cleaner	6
2	Example of present vacuum nozzle for ceiling fan blade	7
3	Reading of fan speed based on fan condition	8
4	PLA Plastic	9
5	Microfiber Cloth	11
6	The 2D Drawing of first part of the nozzle	13
7	The 2D Drawing of second part of the nozzle	13
8	Isometric View	14
9	Top View	14
10	Trimetric View	15
11	Left View	15
12	Front View	16
13	Right View	16
14	Back View	17
15	Bottom View	17
16	Isometric View	18
17	Top	18
18	Trimetric	19
19	Left	19
20	Front View	20
21	Right View	20
22	Back View	21
23	Bottom View	21
24	Drawing of Software NX 10	22
25	View from STL file	24
26	The process of 3D printing	25
27	The process of 3D printing	25
28	The process of 3D printing	26
29	The process of removing the support from the nozzle	28
30	The process of painting the nozzle	28
31	The process of installing the material attach to the nozzle	29
32	The test of the super nozzle vacuum cleaner	31
33	The test of the super nozzle vacuum cleaner	31
34	Test by using Testo and Extech anemometer	32
35	Super nozzle cleaner weight.	39

## LIST OF SYMBOLS

cm	Centimeter
°C	Degree Celsius
cfm	Cubic Feet Per Minute
g	Gram
kg	Kilogram
m/s	Meter per Second
mm	Milimeter
P	Power
<i>P</i>	Pressure
Q	Air Flow Rate

## LIST OF CHART

<b>NO</b>	<b>TITLE</b>	<b>PAGE</b>
<b>1</b>	Room temperature (°C) before and after ceiling fan blade cleaning using Extech mini-anemometer	<b>34</b>
<b>2</b>	Wind speed (m/s) before and after ceiling fan blade cleaning using Extech mini-anemometer	<b>34</b>
<b>3</b>	Reading of wind speed (m/s) before and after ceiling fan blade cleaning using Testo anemometer	<b>36</b>
<b>4</b>	Reading of room temperature (°C) before and after ceiling fan blade cleaning using Testo anemometer	<b>36</b>
<b>5</b>	Weight of dust (gram) collected after cleaning the ceiling fan blade	<b>37</b>